Thymio Escape Room

Escape room developed by Christian Giang, EPFL-MOBOTS in collaboration with the Laboratorio tecnologie e media in educazione
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Overview

Age	10-16
N. of participants	Minimum 8 (two per team), maximum 30 (6 per team)
Subject	Robotics, programming
Keywords	Thymio, VPL, programming, robot, robotics
Play time	40-45' play time plus 45' of debriefing
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In a few words

Participants finds themselves in a dystopic future where energy is scarce and the future of humanity is at stake. A famous scientist managed to build a reactor that could save humanity by providing a huge amount of clean energy. Unfortunately, the scientist died right before he could make it to work. The participants of this escape room will have to conclude the scientist's job by making the reactor start before it's too late. To do so, they will have to program three Thymio robots that have to autonomously get in the reactor at the same time and turn green.

Learning outcomes

This escape room has been developer in the context of educational robotics. Depending on the participants' programming skills, we expect them to

1. Be able to interpret the Thymio predefined behaviour through reverse engineering

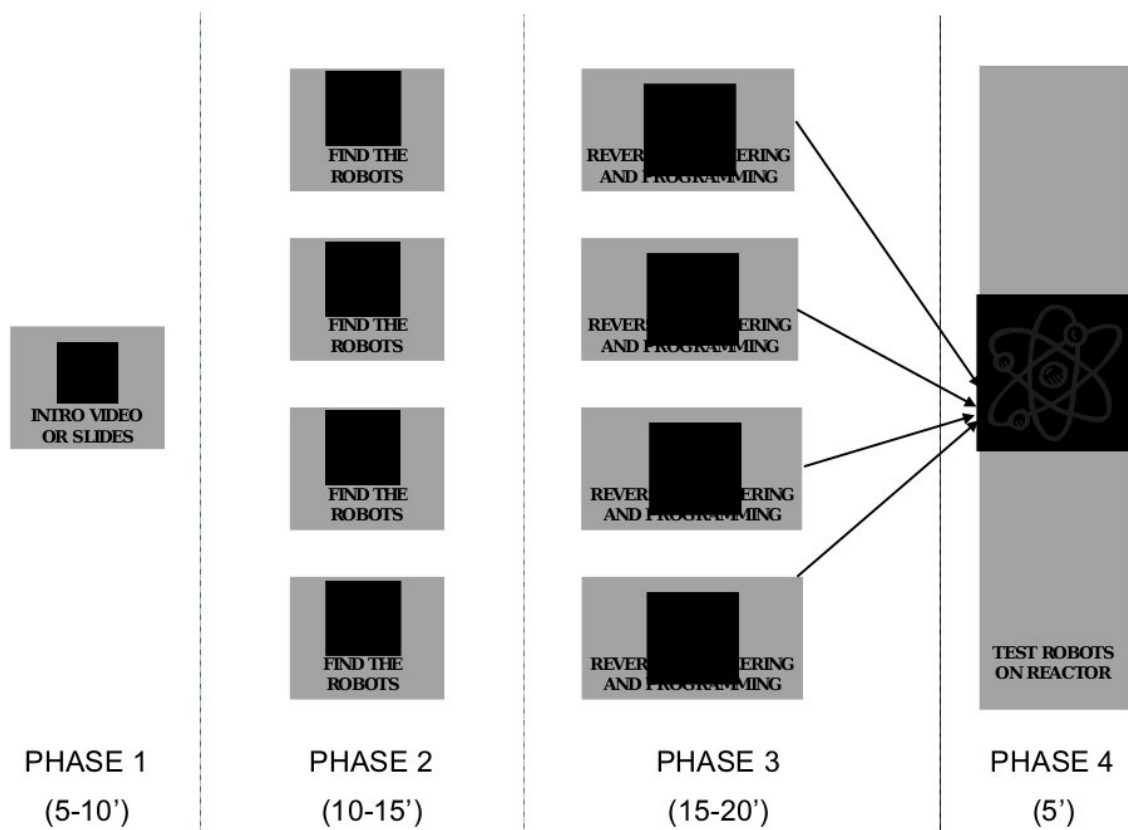2. Be able to re-program the behaviour in order to achieve the objective of the escape room

Use scenario

This escape room has a modular approach: puzzles can be modified or entirely changed to make them easier or harder and thus to adapt the room to different age and skill levels. Class

can be divided in 3-4 teams that can work in parallel to activate the reactor. The room can be presented as a competition among teams or as a cooperative work (i.e., all the teams have to activate the reactor at the same time).

Gameflow

Structure and timing of the escape room

PHASE	DURATION	DESCRIPTION	MATERIALS
PHASE 1	5-10'	*Briefing* The game master welcomes the players, describes the situation, and how to save the planet. Narrative could be started through either the slides or the video. At the end of the briefing and after the class has been splitted, the timer (30 or 45 minutes) can be started.	Video or slides to project on a beamer. The game master can also wear a coat to simulate being a scientist.
PHASE 2	10-15'	*Find the robots* Depending the puzzle chosen (modified, added, removed) this phase can end up being longer or shorted than the suggested duration. Players	3 Thymio per team with the preloaded code. Bags/suitcases to hide the robots. Tables and/or

		have to find the robots hidden in their assigned play area, and find the access to the computers/tables. Robots and passwords can be hidden in locked suitcases, the key can be hidden as a solution of the puzzles (i.e., crosswords). The same can be done for the tables/computers passwords/PINs.	computers to re-program the Thymio locked with a password. Flash lights if the game is played in th dark.
PHASE 3	15-20'	*Program the robots* Players have to discover why the Thymio are acting in a different way than expected and which is the correct behaviour they need to implement. Players have to connect the robots to the computers/tables and re-program them once they understand the pre-loaded behavior, testing them on the given test areas.	Tables and computers have to have a preinstalled Thymio VPL to program the robots. Cables to connect the robots to the machines (they can bee hidden in the previous step). Testing areas for the three robots.
PHASE 4	5'	*Activate the reactor* When players are ready, they can test the solution on the reactor. They only have one chance to test it on the real reactor to start all the Thymio at the same time, get them in the reactor together and turn them green.	Model of the reactor Final video in case of success

Escape Room setup

Escape room materials

Ogni gruppo necessita del seguente materiale:

- A reactor (can be built ad hoc using cardboard or a 3D printer) found in *ReactorTemplate.pdf* (CAD models to print it can be found in *ReactorCAD.dfx ReactorCAD.stp*)
- Reactor surface in A0 format *GroundMap.pdf*
- 3 Thymio robots with USB cables or WiFi dongles
- A test area for each robot in A3 format (red, blue, and yellow) *TestMap_RED.pdf TestMap_YELLOW.pdf TestMap_BLUE.pdf*

- Hints to program the robots (not mandatory) *HintsInitialPrograms.pdf*

The following material can be added to make the experience more interesting and to adjust the difficulty level:

- Flash lights (if dark room)
- Plexiglass cover for the reactor
- Locks and chains to lock the suitcases
- Bags or suitcases
- Printed hints
- Lab coat for the game master
- More material if needed

Room equipment

- Pencils for every game area
- 2-3 computer or tablet with VPL pre-installed for each team
- Beamer with audio to stream the video or the slides, the timer, and the final video (*Intro_Briefing.pptx Introduction.mp4 Countdown.mp4 Outro.mp4*)

Room setup (about 30 minutes)

- Divide the room in play areas of the same size, one for each team
- Place the reactor area
- Place the reactor on the area (following the marks on the reactor area)
- Load the defective programs on the Thymio (red, yellow, and blue, three for each team)
- Hide the three Thymio for each team (either in the play area or in locked bags)
- Hide the USB cables and the test areas for the Thymio
- Place the 2-3 programming tools (computers and / or tables) on each area
- Prepare the video or the slides to start the room
- Darken the room to give an immersive experience to the players

Room reboot (about 20 minutes)

- Delete the programmed code from the computers
- Reload the defective programs on all the Thymio
- Hide the Thymio, cables, test areas
- Lock the computers / tables
- Reset the play areas and / or the reactor if it has been moved during the previous run
- Prepare again the initial video and / or slides

Escape Room in action

Starting the escape room

A possible narrative could start with the players entering the room and with the game master, wearing a lab coat, that explains the situation with the help of the slides or directly showing the video without giving explanations.

Then, the game master should explain the rules and how to correctly turn the reactor on and win the game / escape the room. The class is then divided in groups and each team is given an area. The game can then start.

Playing the escape room

After starting the escape room, the game master can give hints and help the teams that are left behind. The ideal scenario would be to have all the groups to get to the end at the same time, so the game master should give help only to the teams that need it the most and make sure all the teams get to the different phases at the same time. One variation to end the game could be to play the escape room in a cooperative way and ask the players to test the Thymio altogether during the last phase.

Debriefing

The key of the debriefing phase is to recollect all the "puzzle pieces" that compose the narrative and educational aspects of this escape room. For activities that focus on practice like this escape room it is important to give the students time to think about what they have done in practice. Depending on when this activity is played (either at the beginning, in the middle, or at the end of a course) the following points can be discussed.

1. At the beginning players can ask about robots and about the programming interface, the teacher can help clarifying some of the things that were not clear enough during the escape room. The teacher should help understanding the actions the students took and what they have learned. One idea could be to focus on the reverse engineering approach the students took in order to understand how the Thymio initially were programmed paired with what they could see on the VPL.

2. Secondly, robots can be programmed once again with the entire class and their behavior can be discussed. In this case, depending on the students' skills in programming, the teacher could show more or less functionalities of the Thymio, or just take a look once again at the code needed to be programmed in order to successfully escape the room.